Zero Retries

Journal of

The Northwest Amateur Packet Radio Association

VOL. 1 NO. 1 JANUARY 1985

***** THE NEW VANCOUVER PROTOCOL *****

In the last issue of **"the packet"**, the newsletter for **V.A.D.C.G.**, Doug Lockhart, **VE7APU**, presented an abstract of the new datalink protocol being developed in Vancouver. Called **V-2**, this new protocol will replace the previous link level protocol called: **Vancouver Protocol.**

Why, we might ask, would anyone want to come up with a new link level protocol when **ARRL** has already stepped forward and accepted **AX.25** as the standard to be used in North America? Why would anyone want to create a non-standard protocol when over 1400 TNCs are already on the air using an incompatible system?

The only reason I could come up with was that, somehow, Lockhart must feel that **V-2** is better than **AX.25.** That is an issue that will probably remain controversial for some time. But let's look at **V-2** and see how it measures up to **AX.25.**

The original packet radio protocol was in operation in the summer of 1979. It was designed to link nodes with a central controller which assigned address to each station on the air. All traffic passed through the controller. Doug was ask to write a new version for a group in Hamilton, Ontario. Specifically, they wanted the ability to work station to station on packet without the need of the controller. Modifications were made to the existing protocol that would allow for that and this "temporary" software became the **VADCG VANCOUVER PROTOCOL.**

In October of 1982, U.S. hams adopted the **AX.25** protocol which tried to deal with most of the shortcomings of Vancouver Protocol. The choice to go with this new system may well have been the biggest boon to packet radio. It went beyond the link level and introduced a new pseudo networking aspect. Lockhart coined the term: DIGIPEATING. Without this ability to network a string of TNCs together the growth of packet radio would probably have been much slower than it was.

But Lockhart seems to be a purist. The **V-2 Protocol** still leaves this feature out. It is purely LINK LEVEL software. It is level 2 and makes no attempt to corrupt level 3 functions into itself. Until the Canadians come up with the level 3 software to support **V-2**, its growth will probably be very minimal.

Even despite this major deficiency in the new system, V-2 shows itself to be superior in some significant ways. An improvement over the original limited addressing mode allows users on **V-2** to have a unique address. This is derived by running the cyclic redundancy check on the users call. The result is a 16 bit address unlike any other. Headers will not include the actual call sign but a four byte code containing the information needed to recognize the calls of both the sending and receiving stations. Compare this with the 14 or more byte address field used in **AX.25.**

Another interesting feature of **V-2** is the fact that the TNCs will be able to send notes back and forth to determine the most superior version of software that is common to both stations. This allows for later enhancements that may be implemented by some hams and not others. The best version that is compatible with both nodes will automatically be selected.

(continued on next column)

Still another feature that will help the end users is one that provides error information when a disconnect occurs. Both stations will know what caused the disconnect.

The SDLC/HDLC protocol controller chips can be set up to automatically ignore frames that are sent to other nodes. The **V-2** makes use of this feature, the **AX.25** does not. Lockhart says that the system used in the U.S. "requires that the TNC read into memory and examine every frame that is transmitted on the channel." His protocol spares the TNC that added work.

Probably the single most advantageous feature of the Lockhart protocol may just be the use of polling. The P-bit in **AX.25** is not used. When this bit is sent in **V-2**, the receiving station must respond with a supervisory frame. Consider what happens when you are executing a long file transfer. Most of us allow the TNC to have up to four frames "in flight" at one time. This means that nearly 500 characters may be transmitted at a single time. If those frames are received 100% correct, an ACK is anticipated. If something goes wrong and the ACK is not received, even though sent, the entire 500 characters are resent! The **V-2** protocol significantly increases through-put and reduces congestion on the channel by polling the other station with a short supervisory frame. It will continue to poll until an ACK is received. The extra characters are only sent again if they are needed.

All in all, it might be said that Lockhart's protocol is a better level 2 protocol that comes at a time when we desperately need a good level 3. Without the level 3 to support it, the future of **V-2** may be very limited. As work is done to increase the through-put on **AX.25**, especially for backbone work on 220 at higher baud rates, software developers should look closely at the work that Doug Lockhart has done. Tests that have been conducted in Canada clearly show that it is faster, significantly faster when transferring files.

comment by Budd Churchward **WB7FHC**

***** TERMINAL SOFTWARE UNDER DEVELOPMENT AT AEA *****

It has been know for sometime that a few hams in the Seattle area are "test driving" software under developement by **Advanced Electronics Applications, Inc.** for the **Commodore 64**. This software exists on a plug in module. How long before the product is on the market is not known. Some changes in the software are expected, but the hams using it have been very happy running it on packet. File transfers are capable and there is an auto save to disk feature. We are promised more information. Look for a complete review of the software in a future issue.

AEA has greatly aided the development of two LANs in the Puget Sound area with the donation of two TNCs and antennas. They are located in the heart of **NAPRA** country, Lynnwood Washington. **AEA** employee, John Gates (**N7BTI**), has also assisted in the trouble shooting of home built **TAPR** boards. Watch for news from John about upgrading your ROMS to the new software when it is available from Tucson.

****

***** THE PREZ SEZ *****

Well, now we've done it. There is no backing out. We're committed. We all have taken on a big task, but I know we're up to it. What am I talking about? It is the success and continued growth of packet radio as we know it today and would like to see it in the future.

The key to all of this is participation by everyone no matter how large or small. You ask yourself "What can I do? I'm not a technical wizard!"

Well, in this new and struggling area of amateur radio there are NO experts! We're all groping our way around in the dark trying to keep from falling. What is going to make or break us is whether people pitch in and help. So, when the call goes out for people to join committees, to take on a special task, or whatever, please give a hand.

We have a lot planned and there is room for everyone. I am excited about the future possibilities. To start with, our long range goals are to:

1) Interconnect western and eastern Washington north to Vancouver, BC, south to Portland, OR, and east to Idaho and Montana.

2) Set up a HF and Satelite gateway.

3) Take an active part in developing new hardware and software.

Looking to the immediate future, our near term goals are to:

1) Establish operations on 145.01 MHz with a hill top digipeater.

2) Provide a gateway between 145.01 MHz and 224.56 MHz.

3) Spread the gospel according to packet radio, i.e. publicity and demos.

4) Develop public service application of packet radio.

So, as you can see there is fun enough for everyone. Come on in, the water is GREAT!

Dennis Goodwin, **KB7DZ**
President of NAPRA

***** SEARCH AND RESCUE *****

The Pierce County Emergency Search and Rescue Council has purchased three **AEA** packet boards for use in their operations. To back up the TNCs, they have also purchased two **KayPro 2X**'s and a **RADIO SHACK MODEL 100**. The packet stations will be operated on 220 equipment with the main station being located in the Tacoma County City Building.

John, **W7KKN**, has helped Tom, **N7DRT**, put together the stations. A second station, located in a motor home, will be used during Pierce County searches. The third station will be a completely portable unit that can be taken to a mountain top by four wheelers or helicopter. Its primary function will be to provide a link between the search site and downtown Tacoma.

In the past, **ESAR** has been concerned with the security of traffic on amateur bands during searches. The press has learned that a great deal of information can be picked up by listening to ham operations on two meters. It is expected that packet will provide a measure of security like none they have enjoyed before.

Budd, **WB7FHC** and Peter, **WA7FUS**, will be providing training for potential packet operators. The equipment is now in use by hams in the Tacoma area, while preparation for this training takes place.

The TNCs will be on the air using the call **WC7AAO**. The call will only be used during an actual search or a training/testing session. When we hear this call, it is hoped that we will all try to lighten the load on the network. The downtown digipeater will be on the air all the time with an antenna located on the roof of the County City Building. During non-search related activities it will use the call **N7DRT**.

****

******* FROM THE EDITOR *******

ZERO RETRIES? Sure it may sound like some sort of industrial safety slogan, but consider this: It is our hopes to bring you information that will help you enjoy packet radio and keep you up to date on the happenings within **NAPRA**. Another source of information is the **WB7DCH MailBox**. But unlike the MailBox, this newsletter comes to you in the mail in "hard-copy" and it comes to you without the need of a single retry. We hope you will enjoy **ZERO RETRIES** and will share it with your friends. An application for membership is included here so that any of them may also join **NAPRA**.

Feel free to make copies of the application and spread them around. Then watch the Mailbox to see how we grow. You are welcome to copy and reprint any portion of **ZERO RETRIES**. That permission is granted by **NAPRA** provided that you include the name of the author and this publication along with the reprint.

If your retries cannot be zero, we hope they will be few. Happy Packets.

BUDD WB7FHC

MEMBERSHIP APPLICATION
NORTHWEST AMATEUR PACKET RADIO ASSOCIATION

PLEASE PRINT.

NAME _____

CALL SIGN (if any) _____

MAILING ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE NUMBERS (please include area code)

(_____) _____ - _____ home

(_____) _____ - _____ work

PLEASE INDICATE ANY OF THE ABOVE THAT YOU WOULD NOT WANT PUBLISHED IN A MEMBERSHIP ROSTER.

_____

::

PLEASE SEND THE ABOVE APPLICATION AND $15 ANNUAL DUES TO:

WB7FHC - Sec./Tres. NAPRA
13304 131st STREET KPN
GIG HARBOR, WA 98335

MAKE CHECK OR MONEY ORDER PAYABLE TO: NAPRA

::

OPTIONAL QUESTIONNAIRE

1. What class amateur radio license do you have?
   - [ ] A. Extra
   - [ ] B. Advanced
   - [ ] C. General
   - [ ] D. Technician
   - [ ] E. Novice
   - [ ] F. none

2. What type of TNC(s) do you own? Check one or more.
   - [ ] A. AEA
   - [ ] B. GLB
   - [ ] C. TAPR
   - [ ] D. _____
   - [ ] E. none

3. What type of TNC(s) might you be planning to acquire in the future?
   - [ ] A. AEA
   - [ ] B. GLB
   - [ ] C. TAPR
   - [ ] D. _____
   - [ ] E. none

4. Please list below the computer or computers (and/or terminals) that you use or intend to use with your TNC(s).

   _____

5. Please list below the amateur bands you use or intend to use on packet radio.

   _____

6. What is your occupation? _____

7. How would you rate your QTH as a digipeater location?
   - [ ] A. Excellent - very broad coverage
   - [ ] B. Very Good - direct path to many others
   - [ ] C. Good - able to help peripheral stations reach network
   - [ ] D. Poor - on the peripheral of a network
   - [ ] E. Very Poor - few or no direct paths at this time
   - [ ] F. (unknown)

8. On a scale of 0 to 9, how would you rate your expertise in the following areas?

   _____ A. Technical - audio frequencies
   _____ B. Technical - radio frequencies
   _____ C. Technical - digital design
   _____ D. Software design

***** DCH AT LARGE *****

This being the premier issue of the **NAPRA** newsletter, I thought that, as your newly elected Director-at-Large, I should outline the duties of this exhalted office as I see them. My job is, quite simply, to represent YOU to the remainder of the board members. We are all involved on an exciting new frontier of communications where we can make a significant contribution just by operating our stations. We are all learning and as yet there are no real "experts" in the mode, only some voices that are louder than others.

Why **NAPRA**?

We have in our midst some real died-in-the-wool experimenters. We also have some pretty sharp digital, audio, RF, and software types. A couple of people have asked, "Who needs **NAPRA**?". "Why mess around with all the formality and bureaucracy of a formal organization?" "I intend to do my own thing and I don't need the approval of any organization to do it!" -- We agree.

The function of **NAPRA** is not to "approve" of anything, but rather to act as a clearinghouse for ideas and data and to coordinate the activities of the members by forming technical committees and getting together people with similar interests. None of the committees doing "your thing"? Start a committee! We'll try to get you some help. Packet radio involves a lot of disciplines and few of us are blessed with expertise in all of them. Come to the meetings. Express your views. Volunteer for things that interest you. Ask for help; there is nothing we want to see more than getting together people with similar interests and complimentary skills. By pooling our resources we all have an excellent opportunity for personal growth.

Another reason for **NAPRA** is that when significant things come out of our technical committees, as surely they will, these findings will be respected as the considered opinion of a formal organization rather than a minority position taken by a few individuals. This gives our output more "clout" in the eyes of our fellow experimenters and consequently more influence on the directions packet radio will take.

Well, Its time I get off my soapbox for this issue. Some of the things I intend to write about in future issues will include bulletin boards and mailboxes, gateways, network expansion, local area networks, proposals from members and an impassioned plea for written contributions to the newsletter. Hopefully, by the time I've written about all these things, I'll be a lot smarter and have a new bunch of topics to write about. If you have any ideas about things you'd like to read about, drop me a note in the MailBox. If something I or one of the other writers said in this issue really "torques you off", write a response and drop it in the MailBox, but be prepared to see yourself in print!

Tom, **WB7DCH**

***** FROM THE MAILBOX *****

Packet Fragments.... ...Got a call from Dan Ransom, **K7MM**, in Pullman, Washington tonight (11/12). It seems that he is copying the **WB7DCH** MailBox. No great trick - **VACO** is getting into the input of **WR7AJK** (147.60/.00) on South Saddle. **K7MM's** remote base on Kamiak Butte (near the WA/Idaho border) is copying **WR7AJK's** output on 147.00 and downlinking on 450MHz to Dan's **GLB**. (Only in the "garbage" mode - a message there, perhaps?) A friend of his, Andy, **KB7B**, (formerly of **C-Comm**) has an **AEA** TNC but has not yet figured out how to make his **MacJunkpile** talk RS-232C to his TNC....Len Westbo, **W7MCU**, is into **OSCAR** work. He now has two **TAPR** TNCs and is planning to order a **Xerox 820** tomorrow (11/13). Guess who else is apt to be running **WORLI's GateWay/MailBox** software? SINCE THIS APPEARED IN THE MAILBOX, LEN'S **XEROX-820** HAS ARRIVED. LEN SHOWED IT OFF AT THE DECEMBER BOARD MEETING.

****

The following information was placed in the Mailbox on December 12 by John, **KD7UW**.

***** ATS-1 and ATS-3 Satellite Information *****

I Mentioned that there is a possibility that we can get use of **NASA's ATS-1 and ATS-3** satellites. For the Benefit of those who would like to try to listen here is the information:

1	149.175	135.555
2	149.195	135.575
3	149.220	135.600
4	149.245	135.625
5	149.265	135.645
Ch.	UP	Down

ATS-1 is used mostly on channel 3
ATS-3 is used on channels 2 and 4

I took a rough approximation for local LAT/LONG and found the following angles.

ATS-1 (149 Deg W) AZ 211 EL 31
ATS-3 (105 Deg W) AZ 153 EL 32

Signal round trip times are around 0.25 seconds.

Gud Packets de John - **KD7UW**

******** TAPR SOFTWARE *******

The following was down loaded from Compuserve on 11/12/84
de N7BTI

To: TAPR TNC owners:
Fm: WK6K
Re: Software updates.

Since a TAPR software maintanence release will be out soon, I'd like to make sure we have all bug reports and requests for changes in.

I'll list the ones I know about here, along with a disposition, if known.

Please feel free to make comments on any part of the TNC, hardware or software. Please keep in mind the following though:

There are now at least 1300 TAPR TNCs (Beta + kit) in the world today. Many people have written code to match the current user interface, mailboxes, bulletin boards, host systems, gateways, etc. Ask yourself if your proposed change will require a change in user software. If your sugestion would cause recoding of other ham's software, unless it has a major benefit, we would probably have to turn it down. This is called the real world, which is something you get into when 1300 hams are involved.

A few of the discussions below will seem long and involved. That is because some of the bugs are in more advanced features. The majority of the bugs in the more common features were wrung out in the beta test.

On with the bugs:

1) If RETRY is not 0, the TNC will sometimes disconnect before the try count has expired. This problem took a long time to find, because we couldn't reproduce it. Someone in the field came up with a reliable way to make it happen. The symptom was affected by both the number of frames in flight, and the number of frames in the buffer waiting to be sent.

KD4NL has made a patch, we are testing it in the LA area now and will release it next week. This should make some people very happy.

2) TNC "locks up". This is a difficult symptom to trace. Most of them are caused by a fault in the hardware. We have found a bug in the software that causes this, to my knowledge only one person has fallen into this particular hole. This is also patched along with the retry bug.

3) TNC prints garbage on the screen, 64k worth, then comes back. I have heard rumors that the 6LB board can send a frame which causes this to occur when it is received by a TAPR TNC. If anyone has firm information on this, please send it in. Sometimes the rumor comes in as "The 6LB sends an illegal protocol frame", possibly an I or UI frame with no PID byte. Based on that, and the symptom, we have fixed a problem that would occur if that type of frame was received. If you have any info on this, send it in. This will be fixed in the next software update, i.e. it is not patched.

4) The beacon is not started even if a non zero value for beacon time is stored in novram. True enuff. You must give a

(continued next column)

BEACON command after every reset. This bug will be fixed in the next software update.

5) The 400 and 800 baud rates for HBAUD that were there in 2.1 disappearedin 3.1. A patch is available for this, and has been sent to the AMSAT guys who needed it. They use 400 baud PSK thru Oscar 10. Fixed in next software update.

6) *** connect request comes out in transparent mode. I can't make this happen. It will happen if CONMODE is CONV, you are currently unconnected, and you manually go into transparent mode by saying TRANS. When a connect occurs, you will go into convers mode and will see all messages. If you want to do this, and remain in transparent mode on connect, say CONMODE TRANS. If anyone has another way of making this happen, please let me know.

7) If your terminal overruns the TNC's input buffer by ignoring an <xoff> character, the TNC will never try to <xoff> you again. Serves you right, too! This bug should be fixed in the next software update. See also improvement #11 below.

8) TRACE 2xxx bit doesn't work. Non-header data is always dumped.

9) Autobaud is a bit flakey. Since the hardware has no specific baud rate measuring capability, an easy fix is simply to limit the autobaud choices to 300 and 1200 baud. If this would have caused a great deal of difficulty in getting your board up the first time, please let us know.

This is the end of the known bugs, i.e. those things which work counter to the way we intended, or counter to the way things were documented.

Following are change requests:

1) Store a line to be transmitted when your TNC is connected to by another TNC. E.g. CTEXT I'M IN THE SHOWER, PLEASE RING BELL. That message would be sent automatically when a connect occured. This one stands a good chance of getting in.

2) Store a line to be transmitted when your TNC refuses a connect from another TNC. You'd like the other guy to see *** WB6UUT busy: MAILBOX IS DOWN. This is a little more iffy. Since the frame used for a connect nak,DM, has no I field, we have to put the text in a UI frame. The connecting TNC would have to have MON ON, and the UI frame would have to follow the same digipeater path back, which may be a different path than UNPROTO packets usually take. Thus, even if you used this facility, you stand a finite chance of it not working. Is this worth the effort toimplement? Comments please.

3) Link status check. You'd like the TNC to automatically send a frame to see if the other TNC is still there. If not, your TNC would timeout based on RETRY. The command would be CHECK EVERY/AFTER n, where n is some convenient interval. It would not apply if RETRY was 0. This will require a protocol change or update. Right now, with the poll/final controversy, there is no way to prod the other end into giving a response, short of sending a zero length (PID byte only) I frame. This seems abit tacky. This is on the list of things to get resolved at the nextprotocol review in September.

4) Discard unacknowledged I frames when a disconnect occurs. Currently,if there are outstanding frame, i.e. frames waiting to

(continued next page)

be acked or resent, or frames that are in the terminal input queue but as yet unsent, we dump them as UI frames to the UNPROTO address list. This is listed under improvements because this is as we intended it to be, i.e. this is a feature, not a bug. We feel this is a useful diagnostic aid. WE in this paper, by the way, are various combinations of KV7D, KD4NL, and NK6K, depending on which of us is responsible for that part of the code. Comments on this one, please.

5) Implement a TNC resident file transfer protocol. When it comes to file transfers, the TNC was designed to be transparent, just like a modem. In fact, if you go into transparent mode, you can run any program that assumes it's talking to a modem and get the desire dresults. (And no, it doesn't dial the phone on ATDT commands, wise guy). Note that if you want to transfer 8 bit data you must set the AWLEN and PARITY options correctly, otherwise we'll trash the high order bit. Most data transfer programs will run correctly thru the TNC, as long as their internal timers can handle the inherent delays in packet transmission and digipeating. Implementing a TNC based file transfer protocol would please a small number of users, who would still have to write code on their computer to interface with the TNC's file transfer mechanism. I think the current scheme is the right choice, and is more in line with the division of tasks set outin the ISO seven layered OSI model. Comments?

6) Confirm entry into CONVERS mode. You want a warm fuzzy feeling thatthe TNC has done your bidding in response to the CONV command. This would require a change that would bother the mailbox/host/gateway crowd. They do a lot of popping in and out of command mode to check status, paths, and other things. An extra message might put the warm fuzzy message into a file, unless they modified their code. Comments?

7) Go back into command mode after a disconnect initiated by the other TNC. Currently, you are left in CONVERS or TRANS mode. This should not bother mailbox/host types since ctl-C in command mode is ignored. Comments?

8) Implement a watchdog timer. Have the software pulse a bit on the parallel port at some inner point only reached if the software is running correctly. This is so mountain top digipeaters can reset themselves if some thing bad happens. Note that this is different from the hardware transmit timer. Good idea and it will probably be in the next release.

9) Print the digipeat list when:

a) Someone connects to you

b) When you get a connect request

c) When monitoring the frequency.

I think a) and b) should be done all the time. c) would add to an already cluttered monitor mode. Anybody see a better way of doing it. Adding another command to enable this would add to an already lengthy command list. MPATH has been suggested.

10) Print connect and disconnect packets in monitor mode. How about NK6K>WB6YMH <C> WB6YMH>NK6K <D>There are connect ack and disconnect ack frames, but that might beetting carried away.

11) Increase the number of bytes that the TNC will handle from the terminal after the TNC signals <xoff>. Currently, you must

(continued next column)

stop within five bytes. After that, the TNC sends another <xoff> after each of the following five bytes. After that, any characters received before the TNC sends an <xon> are discarded. While this has not been a problem for users writing file dumpers in assembler or some high level languages, it has been a problem for programs which dump a line, then look in their input buffer for <xoff>. We will probably increase the guard space to at least 80 characters. Anyone need more?

12) Output <CR> after the call signs on monitor lines. This wouldgive more room for digipeat paths and not break up data linesas much.

13) Echoing xoff and xon. Currently, if the terminal sends a flow control character out of sequence (xon before xoff, 2 xoffs ina row, etc.), the TNC treats such characters as data and echos them. This has the interesting effect of locking some terminals. It has been suggested that we eliminate this feature and ignore those characters.

That's the list as I know it to be. Submit any others to the TAPR PO box.

Now that we've got a secretary, she's in charge of not losing them. Remember, the TRACE command is handy for looking at the protocol and seeing exactly what the TNC sent/received, including user data. Please include hardcopy of traces for protocol error reports.

NK6K for KV7D and KD4NL, TAPR Software Group.

ED NOTE: READERS WILL RECALL THAT NK6K IS HARLD PRICE WHO WE HEARD ON THE DECEMBER 2 TRN.

***** PACKET AT THE RACES *****

Packet radio is moving into several aspects of amateur radio. One of the places it's being used is Sports Car Club of America logging road rally racing in the northwest. Amateurs have been providing communications for the SCCA road rallies for about 8 years, recently with packet radio. We use mountain top control points to keep tabs on the whole operation with many hams down on the race course itself.

The first time we used packet radio for a rally, we had a little problem. We were trying to connect three mountain top control points together with the two ends over 90 degs apart from the center. We found that using beams on the 440 band didn't work too well. Also, there was a big mountain in between one end and the center.

In the second rally, I found that one of my ground plane antennas was bad. After replacing it we had no problems.

The rally people were so impressed with the operation that they have decided to buy their own TNC's, computers and radios (about ten of them). They will be using business band radios so they can run scoring information, etc.

I have had my TAPR TNC for about 6 months and have been very happy with it. Looking ahead, the possibilities for packet radio are practically unlimited.

Virgil Arrell Jr., W7DFI

Northwest Amateur Packet Radio Association
13304 131st STREET KPN
Gig Harbor, WA 98335